Sediment Flux Assessment in Sinclair and Dyes Inlets

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Sediments are a potential repository for contaminants, and subsequent remobilization of these contaminants can contribute to the overall budget and determination of Total Maximum Daily Loadings (TMDLs). Flux of metals contamination as well as conventional water quality analytes were measured at 7 stations within Sinclair Inlet and 2 stations in Dyes inlet using the Navy's Benthic Flux Sampling Device (BFSD) during the spring of 2000. Sites were selected to represent a range of bulk contaminant loadings and geochemical conditions as determined from a number of historical studies. Conventional water quality analytes include nitrate, nitrite ammonia and phosphate to assess nutrient loading. Oxygen demand was also measured. Metal contaminants measured include antimony, arsenic, cadmium, chromium, copper, lead, manganese, nickel, silver and zinc and were selected based on previous listing on the 303d list and other indications of ecological risk. Flux was measured at each site for 72 hours. Results are presented in poster format. This study was conducted in support of the Puget Sound Naval Shipyard ENVVEST project.

An Analysis in Support of Sediment Quality Thresholds For Polycyclic Aromatic Hydrocarbons (PAHs) To Protect Estuarine Fish

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Under the U.S. Endangered Species Act and the Essential Fish Habitat provisions of the Sustainable Fisheries Act, it is the responsibility of the National Marine Fisheries Service (NMFS) to safeguard the health of fish in estuarine and coastal waters. This includes assessment of the impacts of exposure to toxic chemicals on fish and their critical habitat. This analysis was conducted to assist resource managers in the NMFS in determining when fish are exposed to potentially harmful concentrations of one of the most common environmental contaminants, polycyclic aromatic hydrocarbons (PAHs). Effects thresholds were estimated primarily through segmented regression of site-specific sediment PAH concentrations and associated disease prevalences in a resident fish species, English sole. The analyses and supporting data encompasses several endpoints, including DNA damage, liver lesions, and impacts on growth and reproduction. In general, liver lesion prevalences, DNA adduct levels, and impacts on growth and reproduction were minimal at sediment PAH concentrations at or below 1000 ppb. Above 1000 ppb, there appears to be a substantial increase in the risk of contaminant-related injury to English sole.

Sediment Quality Evaluation in an Urban Lake—Lake Sammamish, Washington

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King County recently completed a sediment quality evaluation of Lake Sammamish. Lake Sammamish is a relatively large lake located approximately 16 km east of Seattle in one of the fastest growing areas of Washington State. The lake is approximately 13 km long and 2 km wide with a surface area of 19.8 km^2. The lake is monomictic and the hypolimnion experiences anaerobic conditions much of the summer. The primary objectives of the study were: (1) to conduct a baseline sediment quality evaluation including both chemical and biological testing; (2) to evaluate relative distribution of potential contaminants of concern; (3) to evaluate sediment toxicity; and (4) evaluate benthic community structure and compare these data with sediment toxicity results. Sediments collected from 16 stations were analyzed for base/neutral/acid extractable organic compounds, pesticides and herbicides, polychlorinated biphenyls, metals, tributyltins, total petroleum hydrocarbons, other conventional parameters. Chemical data were compared to the Washington State draft freshwater sediment guidelines. Three toxicity tests were conducted; *Hyalella azteca* (survival), *Chironomus tentans* (growth and survival), and Microtox®. Benthic invertebrate samples were collected and organisms were identified to species when possible. The highest levels of sediment associated contaminants were found in the vicinity of stormwater discharges. A number of metals and organic compounds were found to exceed the sediment guidelines, however, toxicity test results did not indicate these sediments were having a significant adverse impact on the benthic community. Because the lake is also organically enriched due to relatively high phosphorus loading, it is difficult to determine to what extent the benthic community structure is adversely impacted by sediment associated chemicals.

Biomarker and Histopathologic Responses in Flatfish Following Site Remediation in Eagle Harbor, Washington

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Eagle Harbor in Puget Sound became a Superfund site in 1987 due to high sediment concentrations of polycyclic aromatic hydrocarbons (PAHs) released chronically from a nearby creosoting facility. Earlier studies with English sole from this site (1984-86) demonstrated high prevalences of toxicopathic liver lesions, including neoplasms, in resident sole. Inducibility of neoplasia-related lesions by injections of a PAH-rich fraction extracted from Eagle Harbor sediment has also been shown. Further studies (1986-88) also sampled resident starry flounder and rock sole, and incorporated biomarkers of PAH exposure and effect, including hepatic CYP1A expression, biliary fluorescent aromatic compounds (FACs), and hydrophobic DNA adducts in liver. Hepatic lesion prevalences and biomarker values in these species from Eagle Harbor were among the highest found in Puget Sound. In a combined effort by the USEPA and US Army Corps of Engineers, a cap of relatively clean sediment was placed (9/93-3/94) over the most contaminated portions of Eagle Harbor as an attempt to sequester PAH-contaminated sediments. Lesion prevalences and biomarker values just before capping began were generally reduced compared to historical data, consistent with creosoting facility closure and site-based source controls. Data from fish collected immediately after and at regular intervals up to 72 months after cap completion show an overall decreasing trend in prevalences of certain hepatic lesions and response levels for biomarkers of PAH exposure and effect, strongly suggesting that the sediment capping process has been relatively effective in ameliorating PAH exposure and associated effects in resident flatfish species.